A SURFACE TO SUBSURFACE CORRELATION OF THE LOWER CRETACEOUS PEBBLE SHALE UNIT, NORTHEASTERN ALASKA

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Near vertical exposures of organic-rich, Lower Cretaceous marine mudstone crop out in the northern foothills of the Brooks Range in northeastern Alaska. This mudstone, informally named the pebble shale unit (PSU), is equivalent to the Kalubik Formation in the subsurface. The PSU was deposited in shelfal water depths during the later stages of rifting that led to opening of the Canada Basin during the Barremian. Discontinuous, transgressive sandstone below the PSU is known as the Kemik Sandstone (or Kuparuk C in the subsurface), and stratigraphically above the PSU is a radioactive shale interval often referred to as the gamma ray or highly radioactive zone (HRZ). The HRZ is considered the basal part of the Aptian(?) to Campanian or Maastrichtian Hue Shale. The criteria used to delimit the PSU and the Hue Shale may differ slightly between field and subsurface investigations. In surface mapping, the top of the PSU and base of the Hue Shale is generally defined by the lowest stratigraphic occurrence of bentonite. However, in well logs, the PSU-Hue Shale contact is often defined by the HRZ where the gamma-ray response is >150 API units.

In this study, the PSU is evaluated along the west side of the Canning River and two localities on the north side of the Sadlerochit Mountains where the PSU overlies the Kemik Sandstone. Vertical exposures were measured using standard sedimentologic techniques. A portable gamma-ray spectrometer (GRS) was also used to measure natural radioactivity and samples were collected for lithostratigraphy, biostratigraphy, thin section petrography, total organic carbon (TOC), Rock-Eval II, vitrinite reflectance, and X-ray Fluorescence (XRF). A correlation was made using gamma-ray data from the Canning River locality and the Beli, Canning B-1, Kavik No. 1, and W. Kavik well logs.

The first apparent bentonite in the Canning River section occurs at 33.8 m. If this were considered the PSU-Hue Shale contact then the PSU would be ~33.8 m (111 ft) thick. The GRS profile from the Canning River section; however, displays an abrupt increase to >150 API units at 27.8 m (~91 ft) indicating the base of the HRZ. XRF profiles also record a pronounced enrichment in Se, V, Mo, and U above this level. Only 10.2 m (~33 ft) of the HRZ was measured at the Canning River, and though stratigraphically incomplete, the TOC ranges from 2.83 - 4.61 wt.% (average 3.67 wt.%, n = 10). The PSU displays a wider range of TOC values from 1.02 - 6.15 wt.% (average 4.00 wt. %, n = 32) but this criteria cannot be used to distinguish the units due to the overlap in TOC values with the Hue Shale. Chemostratigraphically, the PSU and Hue Shale have very different signatures but due to the lithologic similarity of the units this boundary would be difficult to determine without GRS data. Previous subsurface work shows a wide range of PSU thickness (~17-69 m or 56-226 ft) within the vicinity of the Canning River. This data needs to be re-evaluated in order to resolve whether or not the same stratigraphic criteria was used to determine if the formation boundaries are internally consistent.

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